The place of ganglion or root alcohol injection in trigeminal neuralgia

M. M. SHARR AND J. S. GARFIELD

From the Wessex Neurological Centre, Southampton General Hospital, Southampton

SUMMARY Of 157 patients with trigeminal neuralgia, referred for neurosurgery, 81 underwent 85 ganglion or root alcohol injections. The results, which are analysed with regard to pain relief and sensory loss, compare favourably with results from the literature of other forms of surgery, particularly open temporal root section.

Although the advent of drugs, such as carbamazepine, has reduced the role of surgery for trigeminal neuralgia, a significant number of patients will either fail to respond to drug therapy or develop serious side effects. In such patients there is no alternative to some form of surgery on the trigeminal ganglion or its sensory root, and Penman (1968), and Northfield (1973) have provided excellent reviews of these methods. As anaesthetic and neurosurgical techniques have improved, and adjuvants, such as the operating microscope, have been used with greater frequency, the number of open operations has increased with a decline in the use of trigeminal ganglion or root injections.

The purpose of this paper is to record the results of injections of alcohol into the trigeminal ganglion or root, and to compare the effectiveness of total sensory loss with partial sensory loss in achieving satisfactory relief of trigeminal neuralgia. Comparison is also made with reports of the results of open root section in which morbidity and even mortality, as well as relief of pain, must be considered.

Case material

During the seven year period 1968–75, 157 patients with idiopathic trigeminal neuralgia were referred to one neurosurgeon (JSG), the majority by neurologists for consideration of surgical treatment. Patients were referred either because their symptoms were already severe enough to warrant injection, or to be made aware of what injection could offer should their symptoms become more severe in the future. There were 93 females and 64 males, ranging in age from 31 years to 92 years with an average of 64 years.

DURATION OF SYMPTOMS AND PREVIOUS TREATMENT

The duration of symptoms before referral varied from one to 30 years with an average of five and a half years. Almost all patients had undergone a trial of drug therapy before referral, the drugs used being carbamazepine, phenytoin, and clonazepam, either singly or in combination. Approximately half of the patients had taken carbamazepine alone, and one-third had taken a combination of carbamazepine and phenytoin. The most common reason for failure of drug therapy was inability to achieve or maintain satisfactory pain relief, and very few patients had unacceptable side effects; only one developed a blood dyscrasia and one intolerable sleepiness, both related to carbamazepine.

DISTRIBUTION OF PAIN

The right side was affected more commonly than the left, in the proportion of 90 to 67; the most common distribution was in the second and third trigeminal divisions (53), followed by the first, second, and third divisions (41), and the first and second divisions (38). These figures are similar in proportion to those of other series (Harris, 1940; Krayenbühl, 1969), as are the figures relating to sex incidence and age range.

TRIGEMINAL GANGLION OR ROOT INJECTION

The decision to recommend injection was made only after careful assessment of the patient and the severity of the symptoms, and after the possible adverse effects of the procedure had been understood and accepted by the patient. The technique used was similar to that first used by Härtel (1912), and further modified by Penman (1949), the passing of a needle through the foramen ovale being performed with the assistance of good quality radiography but without screening and image intensification. An attempt was

made to place the tip of the needle between 4 mm and 8 mm from the top of the trigeminal notch—in some cases a curved side piece was used to achieve a good position—and then, with the needle vertical, 0.3 ml of absolute ethyl alcohol was injected, the patient's initial pain and flushing, as well as subsequent sensory loss, being noted. In some cases, further 0.3 ml increments of alcohol were injected depending on the extent of the sensory loss. We injected 81 patients and four of them had the procedure repeated, due to recurrence of pain, making a total of 85 injections.

Results of injection

INITIAL RESULTS

Pain relief This was achieved in all but one patient in whom a second injection failed and subsequent root section was required. Some patients found slight difficulty in eating but this was transient, and all patients were discharged within two days of the procedure. If applicable, each patient was given careful instructions about oral and eye care, and every patient who was free from pain after the injection remained so at the time of discharge.

Sensory loss Table 1 shows the initial sensory loss obtained either in the divisions affected or in those not affected by pain. Sensory loss, whether partial or total, was always achieved in the divisions affected by pain, but an attempt to achieve total sensory loss was not made in every patient.

Table 1 Initial sensory loss in 81 patients

Sensory loss	Total	Partial	No loss
In divisions affected by pain	55	26	—
In divisions not affected by pain	24	19	12

LATER RESULTS

Pain relief The results in 71 patients (10 patients have been lost to follow-up) have been assessed over periods ranging from six months to seven years with an average of 3.3 years. Table 2 shows the later relief of symptoms related to the initial degree of sensory loss in divisions affected and unaffected by pain. 'Excellent' indicates complete relief, 'good' indicates significant relief and return to normal life, and 'poor' indicates no significant relief. The table refers only to the pain of trigeminal neuralgia; painful dysaesthesia, which is discussed later, is not included.

Sensory loss

(a) *Divisions affected by pain* In the 49 patients in whom total sensory loss was produced, the results

Table 2 Later results in 71 patients related to degree and distribution of initial sensory loss

Initial sensory loss		Relief of pain		
Divisions	Degree	Excellent	Good	Poor
Affected by pain	Total	42	5	2
	Partial	19	1	2
Not affected by pain	Total	19	2	1
	Partial	12	3	1
	No loss	7	2	0

were excellent in 42, despite the fact that 10 of them had some return of sensation at follow-up. When initial sensory loss was partial (22 patients) the results were excellent in 19 patients (Table 2). Of all 71 patients injected and followed up, in 61 (86%) there was complete symptomatic relief, in six (8%) marked improvement, and in four (6%) recurrence of pain.

(b) *Divisions not affected by pain* The 19 patients in whom an excellent result was achieved after initial total sensory loss in the divisions not affected by pain included three in whom there was only minimal sensory loss at follow-up; the 12 patients in whom an excellent result was achieved after initial partial sensory loss in the divisions not affected by pain included two in whom there was no sensory loss at follow-up.

LONG-TERM RESULTS

Twenty-three patients who underwent a single injection have been followed up for four years or more. These have been analysed to see whether there was any significant recurrence of pain over a longer period, since it might be argued that the average period of follow-up (3.3 years) is relatively short. The results are shown in Table 3; the 12 excellent results, where there was initial total sensory loss, included five patients in whom there was only partial loss at subsequent follow-up.

Tables 2 and 3 show that the results following total sensory loss were no better than those following partial, whether this involved divisions affected or unaffected by pain.

Table 3 Long-term results (4–7 years) in 23 patients related to degree and distribution of initial sensory loss

Initial sensory loss		Relief of pain		
Divisions	Degree	Excellent	Good	Poor
Affected by pain	Total	12	3	—
	Partial	7	1	—
Not affected by pain	Total	4	1	—
	Partial	4	1	—
	No loss	3	1	—

ADVERSE EFFECTS

These can be divided into three groups, ophthalmic complications, cranial nerve palsies, and painful dysaesthesiae. The ophthalmic complication rate was low; only two patients needed a tarsorrhaphy of which one was temporary. Two patients developed 9th and 10th cranial nerve palsies which disappeared within one year; one patient developed a 3rd nerve palsy which improved within a few months; one patient had a transient 6th nerve palsy which subsided within 24 hours; and one patient had a disturbance of 8th nerve function which gradually improved over the subsequent two years. The most serious adverse effect of injection was the development of painful dysaesthesiae.

Painful dysaesthesiae

The symptoms included ill-defined tingling, 'worm-like' feelings, burning sensations, a sense of swelling, and 'cold water running down the eye'. They occurred in 11 patients of whom nine were women and two were men. Only five of these 11 patients were disturbed by the symptoms to the point that they expressed doubt as to whether they should have had the injection carried out; and only one patient felt that the symptoms were worse than the original trigeminal neuralgia! The dermatome most commonly affected by painful dysaesthesiae was that supplied by the first division of the trigeminal nerve which was involved wholly or partially in all but two of the 11 patients; when the symptoms occurred in this division they did so in the presence of total sensory loss in all but one instance. The five patients who were disturbed by the painful dysaesthesiae had initial total sensory loss in the divisions affected by pain. Therefore, in five of the 71 patients followed up, the results were poor due to painful dysaesthesiae. Taking into consideration this important complication, the results show that when total sensory loss was produced in the skin supplied by the divisions affected by pain (49 patients), symptomatic success followed in 42 (86%); after partial sensory loss (22 patients) symptomatic success followed in 20 (94%). Thus, overall, 62 (88%) of 71 patients have benefited.

Discussion

TRIGEMINAL ROOT SECTION (TEMPORAL)

The results of series of trigeminal root section (Olivecrona, 1947; Peet and Schneider, 1952; Ruge *et al.*, 1958; Pennybacker, 1961; Krayenbühl, 1969; Northfield, 1973) have shown an incidence of successful relief of pain of over 90% but with some mortality (3.1% in Northfield's 1973 series). The incidence of facial dysaesthesiae, a symptom

which may often detract from relief of pain, was significant, varying from 14% to 85%, except in Pennybacker's series (1961) where it was only 2%, and, therefore, his figure of over 90% relief of symptoms was excellent and probably the best of any series reported. However, many of Pennybacker's cases had a peripheral trigeminal alcohol injection before intradural root section, and he believed this to be a significant factor in the low incidence of facial dysaesthesiae. Krayenbühl's figures (1969) of 95% initial pain relief subsequently dropped to 82% with follow-up, and the facial dysaesthesiae rate was 14%.

The other sequelae of root section included ophthalmic complications (as high as 15% except the impressively low 1.3% of Olivecrona (1947)), and facial nerve palsy—always a hazard of the temporal root section—the incidence of which varied from 5% to 11%. Although the intradural compared to the extradural approach for root section lowered the incidence of postoperative facial palsy, the incidence of hemisphere dysfunction increased (Pennybacker, 1961). An analysis of the number of patients totally relieved of all symptoms involving the face, following trigeminal root section, showed that only 29% of 382 patients were totally asymptomatic (Peet and Schneider, 1952).

TRIGEMINAL GANGLION OR ROOT INJECTION

In the largest series reported (Harris, 1940), 316 out of 457 patients (65%) were relieved of pain from periods ranging from three to 31 years. Comment was made on only a few patients with partial sensory loss but the satisfactory result of such loss was stressed, a view which was reiterated in a much smaller series where the re-injection rate for recurrent pain was only 10% (Jefferson, 1963). Henderson (1965) reported the results of 196 injections, total sensory loss occurring in 87%. One year later 86 patients were re-examined and only 33% had persisting total sensory loss; nevertheless 65% of these patients were free from pain; 50% of the patients in whom the pain recurred developed their symptoms in the first year following injection. This contrasts with Härtel's figures (1912) which showed that 70% of the patients with partial sensory loss developed recurrent pain (from six months to four years following injection), while only 4% with total sensory loss developed recurrent pain.

In the present series, total or partial sensory loss produced equally good results. Assessing the overall results as shown in Table 2, the failure rate with regard to recurrent pain was only 6%, a figure which compares favourably with the results of most series of root sections. Although a significant number of patients with initial total sensory loss were found, at follow-up, to have only partial loss—a much lower

percentage than in Henderson's series (1965)—this did not detract from the beneficial results of the injections. In the small group of 23 patients followed up for more than four years, relief persisted whether the initial sensory loss was partial or total in the originally affected and unaffected divisions. If the incidence of significant painful dysaesthesiae is taken into account the results compare more than favourably with other reported series of injections and of open root sections, with the exception of Pennybacker (1961). There was neither mortality nor facial palsy although all series of root sections report both these complications. The incidence of ophthalmic complications was lower than in all the reports on sensory root section with the exception of Olivecrona (1947). Nevertheless the risk of producing ophthalmic division sensory loss following trigeminal injections is such that any patient who is blind in the eye opposite to the side of the pain should have some other form of surgical treatment carried out.

OTHER METHODS OF TREATMENT

Attempts to achieve selective sensory loss, by a retrogasserian rhizotomy, either suboccipital (Dandy, 1929) or transtentorial (Jannetta and Rand, 1966), have not produced a significant improvement in results in most hands when compared with temporal root section, and the suboccipital operation is associated with a higher mortality.

It remains to be seen whether the more widespread use of the operating microscope will improve results in terms of mortality, morbidity, and lasting relief of pain without dysaesthesiae. The technique of thermo- and electro-coagulation of the trigeminal ganglion has been reported by several workers (Sweet and Wepsic, 1974; Onofrio, 1975), and would appear to have the advantage of achieving excellent initial pain relief with significant preservation of light touch, and without mortality. However, in most series the rate of pain recurrence has been significant, with repeat of the procedure being necessary (Menzel *et al.*, 1975). The results in the series of Onofrio (1975) were excellent but the period of follow-up was not stated. The other methods of treatment such as neurolysis, compression (Shelden *et al.*, 1955), and decompression (Taarnhøj, 1961) have not produced predictable results and have, therefore, failed to gain favour amongst most workers.

Conclusions

1. A properly performed trigeminal ganglion or root alcohol injection offers the patient a high expectation of overall total symptomatic relief.
2. The satisfactory results of partial sensory loss are

such that it is not necessary to persist in achieving total sensory loss if this is not easily attained.

3. The overall complications of trigeminal injection are no higher than those of operative forms of treatment, and the procedure has no mortality.

4. Therefore, trigeminal injection remains a valuable method of treatment for the majority of patients in whom medication has failed to control trigeminal neuralgia. The rare exceptions are those patients in whom blindness in the eye on the side opposite to the pain makes sparing of the ophthalmic division essential.

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